

A NOTE ON THE SEED MORPHOLOGY OF THE GENUS *EUGENIA* L. (MYRTACEAE) IN SOUTHERN AFRICA

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ABSTRACT

The seed morphology of *Eugenia* L. in Southern Africa provides strong additional evidence in support of distinguishing between two species groups which were first recognised on the basis of anatomical characteristics. Descriptions are provided for each group of seeds.

These results could influence the taxonomic treatment of *Eugenia* L. occurring not only on the subcontinent, but throughout Africa.

UITTREKSEL

AANTEKENINGE OOR DIE SAADMORFOLOGIE VAN DIE GENUS *EUGENIA* L. (MYRTACEAE) IN SUIDER-AFRIKA

Die saadmorfologie van *Eugenia* L. in Suider-Afrika verskaf sterk, bykomende getuienis ter ondersteuning van 'n groepering van spesies in twee verskillende groepe wat aanvanklik op grond van anatomiese kenmerke voorgestel is. Beskrywings van die sade word vir elke groep verskaf.

Hierdie resultate kan die taksonomiese hersiening van *Eugenia* L. wat nie alleen in die sub-kontinent nie, maar ook in die res van Afrika voorkom, beïnvloed.

INTRODUCTION

A recent comparative anatomical investigation (Van Wyk, 1978; unpublished results) indicates that the *Eugenia* L. *sensu stricto* species of Southern Africa can be divided into two distinct groups based on certain anatomical characteristics (Van Wyk, Botha & Coetzee, 1980). Some of these characteristics enabled the author to distinguish between species which were confused in the past (Van Wyk, 1980). Consequently a critical study of the external morphology of the plants was undertaken in an attempt to find additional features which support the proposed grouping of the species.

In the present paper some preliminary results concerning the seed morphology are presented. The two species groups mentioned above will be referred to as Group X and Group Y.

In the taxonomy of the Myrtaceae, seed characteristics (especially embryonic structure) are of paramount importance in the delimitation of many genera and higher categories in the tribe Myrteae. The taxonomic value of the mature embryo was first recognised by De Candolle (1828) and today forms the basis of all the taxonomic treatments of this tribe (McVaugh, 1968).

Despite the acknowledged taxonomic value of seed characteristics, it is often neglected in taxonomic work because of the lack of fruiting material in herbaria. The regional revisions of the genus *Eugenia* L. *sensu lato* for Malaya (Henderson, 1949) and Hawaii (Wilson, 1957) are probably two of the few works in which the nature of the seeds was described in some detail for many of the species.

Descriptions of the seeds of Southern African *Eugenia* species were mostly limited to vague comments pertaining to size, form and colour. In their revisions for Southern Africa, both Dümmer (1912) and White (1978) attached no obvious interspecific taxonomic significance to the seeds of this genus.

MATERIAL AND METHODS

Dried fruit from herbarium sheets was rehydrated by transferring to water and boiled for about 30 minutes. In rehydrated material, however, seed characteristics are not very reliable. If available, preference was thus given to fruits which were either fresh or preserved in formalin-acetic acid-alcohol (FAA).

All material was identified according to the criteria used in the original descriptions of the taxa and in most cases also by comparison with type specimens. The results are based on seeds from the following species:

GROUP X	GROUP Y
<i>Eugenia capensis</i> (Eckl. + Zeyh.) Sond.	<i>E. albanensis</i> Sond.
<i>E. cf. mossambicensis</i> Engl.	<i>E. erythrophylla</i> Strey
<i>E. natalitia</i> Sond.	<i>E. verdoorniae</i> Van Wyk
<i>E. simii</i> Dümmer	<i>E. woodii</i> Dümmer
	<i>E. zeyheri</i> Harv.
	<i>E. zuluensis</i> Dümmer

RESULTS

Seeds of all the species possess a testa which is free from the pericarp and lies close to the surface of the embryo. The mature embryo consists of two apparently homogeneous, but in fact only partially fused, thick and fleshy plano-convex cotyledons, connected by a short radicular protuberance. A line of separation is visible on the more or less smooth surface of the embryo, between the cotyledons which lie side by side.

Apart from these mutual characteristics, species belonging to Group X differ in their seed structure from species belonging to Group Y. All the references to shape in the descriptions which follow, are based on seeds from fruits in which only one ovule had developed. If more than one ovule develops in the same fruit, the seeds are often variously compressed—this, however, is the exception rather than the rule.

GROUP X (Fig. 1): *Seed* (and embryo) reniform to subreniform, rarely oblong globose. *Testa* thin (c. 0.25 mm thick) and membranous, outer surface smooth,

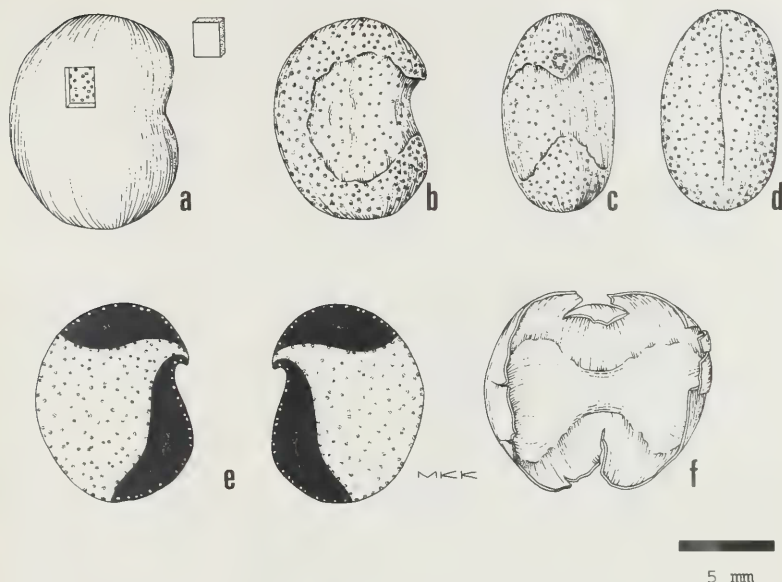


FIG. 1.

Seed morphology of *Eugenia natalitia* Sond.—GROUP X: a, seed with part of thin testa removed, showing surface of embryo beneath; b, lateral view of conspicuously glandular punctate embryo; c, ventral view of embryo showing spot of densely arranged glands on radicular protuberance; d, dorsal view of embryo showing the short line of separation between the two cotyledons; e, split-open embryo, showing region of fusion (black) between cotyledons; f, split-open testa, showing the slightly raised pattern on inner surface.

light brown; inner surface with a slightly raised, lighter-coloured pattern resembling in outline two horseshoes connected between the open ends. *Cotyledons* equal, bright green (when fresh), all the free surfaces conspicuously glandular-punctate, opposing faces more or less plane; the line of demarcation more or less straight; outer surface of each cotyledon with a horseshoe-shaped pattern due to a slightly depressed or irregular cotyledon surface with often slightly smaller and lesser glands than the remaining surface: this pattern corresponds with the one on the testa. *Radicular protuberance* with a circular dark-coloured spot from which the radicle probably grows on germination.

GROUP Y (Fig. 2): *Seed* (and embryo) globose to subglobose. *Testa* thick (c. 1.0 mm) and woody, outer surface of one hemisphere more or less smooth and light brown, the other half thinner, covered by remains of the pericarp, dark coloured; inner surface with a prominent depression, lined with a whitish tissue. *Cotyledons* equal to nearly equal, pale green to greenish-white (when fresh),

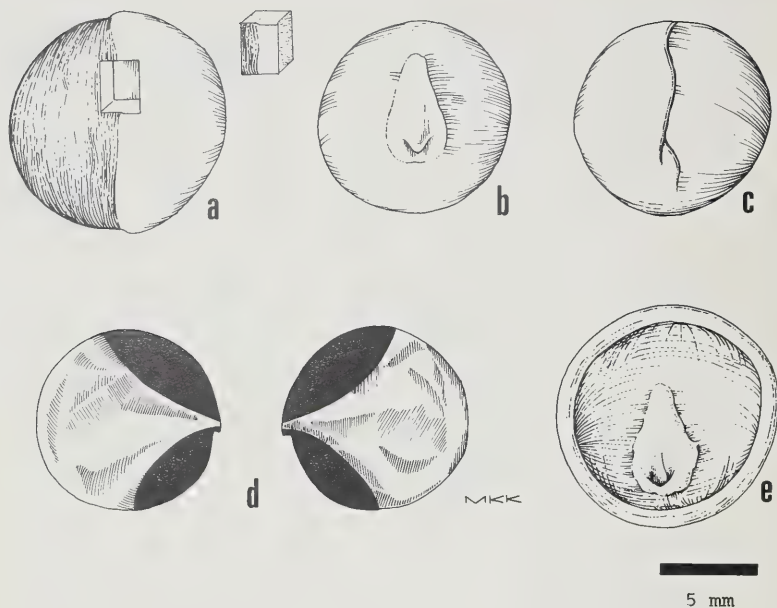


FIG. 2.

Seed morphology of *Eugenia zeyheri* Harv.—GROUP Y: a, seed with part of thick testa removed, showing embryo beneath; b, embryo with short radicular protuberance surrounded by a slightly raised light-coloured pattern; c, embryo with branched line of separation between the two cotyledons; d, split-open embryo, showing irregular inner surface of cotyledons and region of fusion (black); e, one half of testa, showing the light-coloured depressed pattern on inner surface.

apparently eglandular but usually with a few obscure glands mainly associated with the radicular protuberance; opposing faces usually somewhat concave or with ridges fitting into corresponding grooves, sometimes more or less plane; the line of demarcation straight, curved, or ramified; outer surface of each cotyledon with a slightly raised, more or less linear, ovate or obovate, smooth-surfaced strip of tissue running around the radicular protuberance dorsally towards the start of the demarcation groove, fitting into the depression on the inner surface of the testa. *Radicular protuberance* with the spot from which the radicle grows (cf. Group X) probably present, but obscure.

DISCUSSION

The division of the Southern African *Eugenia* species into two groups on the basis of anatomical characteristics is correlated with two morphologically different

kinds of seed. This points towards the existence of at least two major lines of evolution in the local members of this genus.

It would appear that the species of Group X and Group Y are in fact not as closely related as was believed by previous authors. According to the present results the delimitation of some of the taxa proposed by White (1977, 1978) needs serious reconsideration.

Amshoff (1958) believed that the African members of *Eugenia* have the testa probably adhering to the pericarp, thus differing from the American members, in which the testa is free. This, however, was not confirmed by the present study. In all the species examined the testa remains on the cotyledons when the pericarp is removed. Furthermore, the seeds of Group X closely resemble those of *E. uniflora* L. from South America, which is the lectotype species for the genus *Eugenia* L.

For the present, no suggestions are made as to a formal taxonomic rank for Group X and Group Y. Features of much more African species need to be studied to ascertain the full taxonomic implications of these findings.

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